

Appl. No. 10/044,268
Amdt. Dated. Oct. 3,2003
Reply to Office Action of August 7, 2003

REMARKS

Claim Rejections under 35 USC § 103

The Examiner has rejected claims 1, 7 and 11 as being unpatentable over Pelekhaty (U.S. Patent No. 6,215,592) in view of Mitsui (U.S. Patent No. 6,042,752). The Examiner has rejected claims 2-3, 8-10 and 12-14 as being unpatentable over Pelekhaty in view of Mitsui, and further in view of Adair (U.S. Patent No. 6,490,381), and has also rejected claim 6 as being unpatentable over Pelekhaty in view of Mitsui and Adair, and further in view of Goosen (U.S. Patent No. 5,914,804). These rejections are traversed and overcame as below.

Regarding claim 1, a thin film filter for dense wavelength division multiplexing, the thin film filter comprises a glass substrate and a film stack mounted on the glass substrate, the film stack including a plurality of cavities; wherein each cavity comprises a first mirror layer, a second mirror layer, and a spacer layer arranged therebetween, both of the first mirror layer and the second mirror layer including low refractive index thin films and *high refractive index thin films consisting of a composition of indium-tin oxide which has a high refractive index*, therefore, a substantially different refractive index between the low refractive index thin films and the high refractive index thin films is formed.

The Examiner argues that it is obvious, because Pelekhaty teaches a thin film filter for dense wavelength division multiplexing, the filter comprising a glass substrate, a film stack on the glass substrate comprising low refractive index thin

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films and high refractive index thin films, and Mitsui teaches the use of tin oxide including indium as a thin film light transmissive layer.

Applicant disagrees with the Examiner at this point, and the detailed will be described as follows..

Firstly, Pelekhaty reference relates to an optical filter, and Mitsui reference relates to a transparent conductive film with tin oxide. Mitsui teaches the transparent conductive film being used as a transparent electrode (Column 1, lines 14-21). An electric current is necessary to operate the transparent conductive film. Light can transmit through the transparent conductive film, while a light with a particular wavelength can not be filtered. **The transparent conductive film of Mitsui belongs to an electric domain.** The optical filter of Pelekhaty is for filtering a light with a particular wavelength, and belongs to an optical domain. Therefore, the two cited references respectively belong two different and not analogues arts. It wouldn't be proper to combine these two disparate cited references since they are from *unconnected fields* and thus it would not obvious to combine them. There is *no suggestion that indium-tin oxide should be used in the optical filter to form a substantially different refractive index* between low refractive index thin films and high refractive index thin films from reading the cited references or combinations thereof.

Secondly, Mitsui teaches the transparent conductive film with tin oxide having low resistance and high scratch resistance. However, the filter of the present invention has high refractive index thin films with indium-tin oxide. Such structure makes the filter reducing the numbers of layers and eliminating the

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internal film stress. No hint or suggestion teaches in the two cited references that a film with indium-tin oxide used in a filter can reduces the layers and eliminates internal film stress of the filter. This *novel* structure of the optical filter of the instant invention produces *unexpected and surprising advantages*, therefore, should be considered as non-obvious.

The Examiner states the limitation of the decreased internal stress is not present in the language of the claim 1 and no evidence has been supplied to suggest unexpected results. The applicant disagrees because the **claim 1 has clearly defined the structure of the filter**. Such structure makes the optical filter with fewer layer and more resistant to internal stress in the film layers comparing with a conventional optical filter. Furthermore, the **structure and the operation principle of the optical filter are clearly and distinctly disclosed in specification (page 5, lines 9-18) to support the claims.**

Thirdly, claim 1 defines (*I*) the thin film filter including a glass substrate and a film stack with a plurality of cavities. Also, claim 1 defines (*II*) each cavity having a first mirror layer, a second mirror layer and a spacer layer located between the first and second mirror layers.

On page 3, lines 1-2, the Examiner states that the filter of Pelekhaty includes a glass substrate 200 and a film stack with a plurality of cavities 178, 182, 180. The Examiner also states the cavity 180 comprises a first mirror layer 194 and a second mirror layer 176. While, the cavity 180 does not have a spacer located between the first and second mirror layers 194, 176. Only the element 180 is located between the first and second mirror layers 194, 176. The element 180 can not be interpreted

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to both cavity and spacer. Therefore, the filter of Pelekhaty only reads on a limitation (I) in claim 1. Mitsui only teaches a composition of indium-tin oxide used in optical component. Mitsui fails to disclose a component reading on both the aforementioned limitations (I) and (II) in claim 1. Accordingly, it is unobvious to derive a filter meeting the two aforementioned limitations (I) and (II) from Pelekhaty in view of Mitsui.

Accordingly, the thin film filter of the present invention can not be derived from Pelekhaty in view of Mitsui.

Regarding claim 7, since claim 7 depends from claim1, claim 7 should likewise be patentable.

If further argument is needed, the compound defined in the claim 7 is a mixture of indium oxide and tin oxide. However, Mitsui teaches the compound having an indium content being between 0.1 and 30 percent and a gallium content of 0.1-30 percent. One person of ordinary skill in the art can not derive the compound of the present invention from the compound of Mitsui. Firstly, the composition of the compound is different. The composition of the compound of Mitsui is indium content and gallium content. The composition of the compound of claim 7 is indium oxide and tin oxide. Secondly, the percentage is different. The compound of Mitsui is made of an indium content of 0.1-30 percent and a gallium content of 0.1-30 percent. The compound of the present invention is from 20% indium oxide plus 80% tin oxide to 17% indium oxide plus 83% tin oxide. There is no suggestion or motivation in the cited references to apply a mixture of indium oxide and tin oxide with a predetermined percent in a filter.

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Regarding claim 11, claim 11 defines a filter having a substrate and a film stack with five cavities. Each cavity has a plurality of layers. Each layer has low refractive index thin films and high refractive index thin films comprising a composition of indium-tin oxide having a refractive index of about 2.1. The number of layers in the five cavities is about 160. The Examiner states it is unobvious in view of Pelekhaty and Mitsui.

Applicant disagrees with the Examiner at this point, and the detail will be described as below.

Firstly, the two cited references respectively belong two **different and non-analogous fields and can not be combined**, as discussed with respect to above claim 1.

Secondly, **no hint or suggestion teaches in the two cited references that a film with indium-tin oxide used in a filter can reduces the layers and eliminates internal film stress of the filter**, as discussed with respect to above claim 1.

Thirdly, it is unobvious to derive a filter with a spacer from Pelekhaty in view of Mitsui, as discussed with respect to above claim 1.

Fourthly, the two cited references fail to disclose the number of cavities (5) and the number of layers (160). The Examiner states the limitation is obvious duplication of the known parts of the Pelekhaty reference. Applicant

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acknowledges that mere duplication in comparison with the prior art may not be patentable. Anyhow, application asserts that the invention is *not only a "mere" duplication change*. One person with ordinary skill in the art knows the number of the cavity and layers of an optical filter results the optical performance of the optical filter. More layers of the optical filter, narrower pass bandwidth. More layers of the optical filter, more attenuation. It is required to select a particular layer number to optimize the optical performance of the optical filter, that is, narrower pass bandwidth and less attenuation. Thus, **the layers of the optical filter is not mere duplication, the number of the layers must be precisely accumulated.** Therefore, the number of cavities (5) and the number of layers (160) can not be obviously derive from the two cited reference by simply duplication.

Therefore, the filter defined by claim 11 is novel over the cited references, and produces *unexpected and surprising* advantages; therefore, claim 11 should be in a condition for allowance.

Regarding claims 2 and 12, the Examiner states Adair teaches an optical switch with a coupling film 718, and states claims 2 and 12 being unpatentable over Pelekhaty in view of Mitsui, and further in view of Adair. Applicant disagrees with the Examiner at this point, and the detail will be described as below.

Firstly, the Examiner states Adair discloses an element 718 used in an optical switch for connecting two filters. While the coupling film of the present invention adjoins an adjacent cavity of the plurality of cavities of the filter. The coupling film is an element of the filter. The element 718 is a part of the optical switch. Although, the filter and the optical switch are components used in optical

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communication. The function and structure of the filter and the optical switch is significantly different. There is no hint or suggestion to apply an element of optical switch into a filter.

Secondly, the element 718 of Adair is a layer located between two filters. The structure of the layer is not clearly described. No hint or suggestion in the cited reference teaches the layer is a film. One person with original skill in the art can not derive a film used in a filter from a layer used in an optical switch.

Therefore, the filter defined by claims 2 and 12 are novel over the cited references, and produce *unexpected and surprising* advantages; therefore, claims 2 and 12 should be in a condition for allowance.

Regarding claims 3 and 13, since claims 3 and 13 respectively depend from claims 2 and claim 12, claims 3 and 13 should likewise be patentable.

Regarding claims 8 and 14, the Examiner states that Pelekhaty in combination with Mitsui teaches the invention as claimed but lacks reference to the low refractive index material being silicon or aluminum oxide. The Examiner also states Adair teaches the use of silicon oxide as the low refractive index material in combination with indium tin oxide as the high refractive index material.

However, the combination of silicon oxide with indium tin oxide is *not* used to solve the problems of *internal film stress in an optical filter*. Due to the multi-layer design and film deposition process of multiple cavities in film stack, the internal film stress is very high which make the film stack deposition extremely

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difficult to contain the insertion loss. The instant invention has overcome this sever problems in the optical filter by utilizing indium-tin oxide with the low refractive index material, which is not suggested in any cited references or combinations thereof. Therefore, claims 8 and 14 should be considered as non-obvious and should be in condition for allowance.

Regarding claim 9, since claim 9 depends from claim 8, claim 9 should likewise be patentable.

Regarding claim 10, since claim 10 depends from claim 9, claim 10 should likewise be patentable.

Regarding claim 6, the Examiner states that claim 6 is unpatentable over Pelekhaty in view of Mitsui and Adair, and further in view of Goosen. Applicant disagrees with this rejection. Claim 6 depends from claim 3, and claim 3 can not derive from Pelekhaty, Mitsui and Adair as argued above. Comparing with claim 3, claim 6 further defines the spacer layer has an optical thickness of an integer times one-quarter of a central wavelength of a pass bandwidth of the thin film filter. However, Goosen only discloses a spacer layer with an optical thickness of one half wavelength. Therefore, claim 6 is unobvious over the cited references, and should also be in condition for allowance.

In conclusion, the non-obviousness of the instant invention is reasoned as follows:

- (1) The primary two references, Mitsui and Pelekhaty, belong to two different fields.

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(2) There is no suggestion or motivation to combine these two references. When a rejection depends on a combination of prior art references, the PTO must show that there is some teaching suggestion, or motivation to combine the references. In re Geiger, 815 F.2d 686, 688, 2USPQ2d 1276, 1278 (Fed. Cir. 1987). A conclusion of obviousness may be based on a combination of references only where there is some reason, suggestion, or motivation to combine those references to arrive at the claimed invention. In re Dembicza, 175 F.3d at 999, 50 USPQ2d (BNA) at 1617 (Fed. Cir. 1999).

(3) None of the cited references address the problem, i.e., *elimination of internal film stress*, and needless to say the solution, i.e., *reduction of the layers by means of usage of indium-tin oxide*. The mere fact the prior art may be modified in the manner suggested by the Examiner does not make the modification obvious unless the prior art suggested the desirability of the modification. In re Fritch, 972 F.2d 1260, 1266, n.14, 23 USPQ 2d 1780, 1783-84 n.14 (Fed. Cir. 1992). Without such a motivation, no obviousness could be concluded in the instant application.

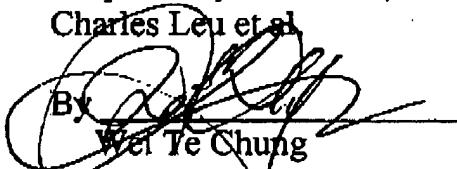
(4) The Examiner believes that disregarding the fact of "decreased internal stress" is proper because (I) such a functional limitation is not shown in the claims and (II) no evidence has been supplied to suggest unexpected results (office action, page 7). As argued earlier in page 7 of this amendment, the structure defined in claims inherently owns this advantage. Also referring to the specification, page 2, paragraph [0004], lines 6-11, paragraphs [0005], [0006] and [0007], it evidentially shows the invention performs elimination of internal stress. Accordingly, the Examiner rejection's basis is improper. Moreover, as mentioned in (3) above, nowhere in the cited references disclosing or suggesting "elimination of internal stress" refers to no motivation for combination and concludes non-obviousness.

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In view of the above claim amendments and remarks, the subject application is believed to be in a condition for allowance and an action to such effect is earnestly solicited.

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